



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/964,918	09/27/2001	Casey J. Grant	BUR920010039US1	3176
5409	7590	09/28/2004	EXAMINER	
ARLEN L. OLSEN SCHMEISER, OLSEN & WATTS 3 LEAR JET LANE SUITE 201 LATHAM, NY 12110			TRAN, BINH X	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 09/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/964,918

Applicant(s)

GRANT ET AL.

Examiner

Binh X Tran

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 July 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-7, 19, 20, 22-26, 29-34 and 44-65 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 2-7, 19, 20, 22-26, 29-34 and 58 is/are allowed.
- 6) ☒ Claim(s) 44-46, 50-55, 59-62 and 65 is/are rejected.
- 7) ☒ Claim(s) 47-49, 56, 57, 63 and 64 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 44-45, 51-53, 55, 59-60, 62 are rejected under 35 U.S.C. 102(b) as being anticipated by Yu et al. (US 6,013,570).

Respect to claim 44, Yu teaches a method comprising the steps of:

forming a patterned hard mask layer (312) over a polysilicon (304) layer (fig 3b);

patterning the polysilicon layer to provide a hard mask-capped polysilicon line having a first width (W1) (Fig 3C, col. 7 lines 1-5);

isotropically removing portions of the polysilicon line to a second width having a value less than value of a minimum dimension producible by a photolithographic process used to form the patterned hard mask layer (Fig 3E, col. 7 lines 8-18).

Respect to claims 51, Yu teaches to form a gate dielectric layer (306) on the top of the substrate and forming polysilicon layer (304) over the gate dielectric. Respect to claims 45 and 52, Yu teaches to remove the patterned hard mask layer (Fig 3G, col. 7 lines 28-30). Respect to claim 53, Yu teaches to simultaneously remove a portion of the dielectric layer not covered by the polysilicon gate electrode and the patterned hard mask (Fig 3G). Respect to claim 55, Yu teaches the substrate is silicon (col. 6 lines 59-

Art Unit: 1765

60). Respect to independent claim 59, Yu teaches to form source/drain region (326/328) in the substrate after removing the patterned hard mask layer (Figure 3H).

The limitation of claims 60 and 62 has been discussed above.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 46, 54, 61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu in view of Vahedi et al. (US 6,316,169)

Yu teaches the hard mask comprises oxide, nitride, or silicon oxynitride material (col. 10 lines 15-20). Yu does not explicitly teach the hard mask comprises silicon oxide. Vahedi discloses that the hard mask comprises either silicon oxide, or silicon nitride or silicon oxide nitride (col. 5 lines 25-30). It would have been obvious to one

Art Unit: 1765

having ordinary skill in the art, at the time of invention, to modify Yu in view of Vahedi by using silicon oxide because equivalent and substitution of one for the other would produce an expected result.

6. Claims 50, 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu in view of Meikle (US 5,942,449).

Respect to claims 50 and 65, Yu fails to disclose that the isotropic polysilicon etching step is performed by using etching solution comprises HF, HNO₃, and H₃PO₄. However, Yu clearly teaches that any conventional isotropic etching process can be used (col. 7 lines 15-18). Meikle teaches to use solution of HF, HNO₃ and H₃PO₄ to etch polysilicon layer (col. 4). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Yu in view of Meikle by using solution of HF, HNO₃ and H₃PO₄, because it provides good etching uniformity.

7. Claims 50, 65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yu in view of Nakatani (US 6,446,641).

Respect to claims 50 and 65, Yu fails to disclose that the isotropic polysilicon-etching step is performed by using etching solution comprises NH₄OH, H₂O₂ and water. However, Yu clearly teaches that any conventional isotropic etching process can be used (col. 7 lines 15-18). Nakatani teaches to use solution of NH₄OH, H₂O₂ and water to etch polysilicon layer (col. 6 lines 45). It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Yu in view of Nakatani by using solution comprises NH₄OH, H₂O₂ and water, because it reduces the defect in the gate oxide layer.

Allowable Subject Matter

8. Claims 2-7, 19-20, 22-26, 29-34, 58 are allowed.
9. Claims 47-49, 56-57, 63-64 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
10. The following is a statement of reasons for the indication of allowable subject matter: The cited prior arts fail to disclose or suggest either one of the following step in conjunction with all other limitation in the claim: converting a surface of the polysilicon line to an oxide layer and isotropically etching the oxide layer, or treating the polysilicon line in saturated aqueous solution of O₃ to form an oxide layer on the polysilicon line following by etching in a HF solution or HF containing vapor, or calculating a number of polysilicon oxidation/isotropic polysilicon oxide etch cycles base on the differential and performing the calculated number of polysilicon oxidation/isotropic polysilicon oxide etch cycles.

Response to Arguments

11. Applicant's arguments filed on 7-13-2004 with respect to the amended claims 2-7, 19-20, 22-26, 29-34 have been fully considered and are persuasive. The examiner, therefore, withdraws the previous rejection.
12. The applicants fail to provide a persuasive argument with respect to new claims 44-65. Thus, a new ground of rejection was set forth to address applicant's new claims.

Conclusion

Art Unit: 1765

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X Tran whose telephone number is (571) 272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine G. Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh X. Tran

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER
